

1 DEVICE FOR THE CONTROLLED DISTRIBUTION OF
2 PULVERULENT PRODUCTS

3
4 The object of the present invention is a device for
5 the controlled distribution of pulverulent products,
6 including a feed container for said product having
7 an outlet aperture sealed by a rotor provided with a
8 plurality of transfer cavities, each of which
9 comprises an inlet aperture and an evacuation
10 aperture, the paths of said inlet apertures
11 successively passing opposite said outlet aperture
12 in order to be filled with said product and said
13 evacuation apertures passing successively opposite a
14 distribution aperture connected to means to evacuate
15 said pulverulent product from said transfer
16 cavities, for emptying therein, of the sealing
17 surfaces of said inlet and evacuation apertures
18 disposed along said respective paths and means to
19 drive said rotor.

20
21 Such a device has already been proposed in WO
22 01/26863 to feed an abrasive particle projection
23 system. It comprises a disk-shaped rotor provided
24 with a series of cylindrical cavities distributed

1 uniformly along a circle centred on the rotational
2 axis of the disk, the axes of which are parallel to
3 this rotational axis. This disk is sandwiched
4 between two plates fixed together leaving just
5 enough clearance for the disk to rotate. One of the
6 plates has an aperture communicating with the outlet
7 of a pulverulent product feed hopper, which is
8 located on the path of the disk cavities. The other
9 plate also has a distribution aperture located on
10 the same path which is coaxial to another aperture
11 passing through the first plate and linked to a
12 pressurised air source, such that every time a
13 cavity filled with powder passes between both
14 coaxial apertures, the powder is discharged into the
15 distribution aperture by the fluid pressure.

16

17 If the principle of this dosing device is reliable,
18 its implementation has several disadvantages in its
19 manufacture and operation, as well as in the
20 concentration uniformity of the distributed powder.

21

22 It can be noted that a major problem is the problem
23 of guiding the disk between both sealing plates
24 which cover each of its faces. This results notably
25 from the fact that the disk is integral with a drive
26 shaft pivotally mounted as a result of two rollers
27 integral with both respective plates. Given that the
28 clearance between the disk and the sealing plates
29 must be as small as possible in order to prevent
30 escape of the powder which is held within the
31 cavities by the adjacent faces of the sealing plates
32 between which the disk rotates, yet that the disk

1 must however be able to rotate without causing
2 excessive heating, the difficulty of the problem to
3 be resolved is apparent.

4
5 In this device, the inlet aperture of the first
6 sealing plate and the distribution inlet of the
7 second sealing plate are diametrically opposed. The
8 reason for this arrangement was that it was thought
9 necessary to have a sufficient distance between both
10 apertures to ensure effective sealing to prevent the
11 powder contained within the cavities from escaping.
12 Given that it is however impossible to ensure total
13 containment of the powder by this means, sooner or
14 later the result is the formation of a film of
15 powder between the adjacent faces of the disk-rotor
16 and sealing plates, which brakes the disk and causes
17 excessive heating.

18
19 It can also be mentioned that the cavities of the
20 disk-rotor are comparatively large and spaced apart,
21 such that the concentration of the powder as a
22 function of time fluctuates more or less
23 sinusoidally.

24
25 The aim of the present invention is to overcome, at
26 least in part, the above-mentioned disadvantages.

27
28 To this end, the object of this invention is a
29 device for the controlled distribution of
30 pulverulent products according to Claim 1.

31
32 The main advantage of this solution is that it gives

1 a degree of freedom to the transfer cavities in
2 relation to the sealing surfaces, allowing optimal
3 contact between these surfaces and the apertures of
4 the transfer cavities without the likelihood of
5 overheating, considerably reducing the precision
6 stresses. Moreover, advantageously, the rotational
7 axis of the moving parts is itself and directly the
8 positioning reference between the moving parts and
9 the fixed parts of the device, already ensuring
10 precise guiding of the rotor.

11
12 As a result of this arrangement, the tolerances
13 between these fixed and movable parts can be further
14 reduced insofar as direct guiding eliminates the
15 tolerances resulting from the fact that both guiding
16 surfaces between the fixed and movable parts and
17 between the latter and the drive means are
18 concentric surfaces which are both arranged on the
19 disk-rotor itself, which provides for a large degree
20 of precision without particular difficulty. The
21 degree of freedom provided to the transfer cavities
22 and the reduction of these tolerances allow the
23 likelihood of the pulverulent product escaping to be
24 reduced and as a result the likelihood of the disk-
25 rotor blocking and heating.

26
27 Another consequence of this greater flexibility and
28 greater guiding precision means that it becomes
29 possible to substantially reduce the distance
30 between the outlet aperture of the feed hopper
31 filling the transfer cavities of the rotor and the
32 distribution aperture of the pulverulent product.

1
2 Therefore, it becomes possible to considerably
3 reduce the size of the sealing surfaces of the
4 transfer cavities between these outlet and
5 distribution apertures, as it is sufficient to cover
6 a small part of the surfaces of the disk-rotor
7 alone, such that the greater part of these surfaces
8 can be free, further reducing thereby the likelihood
9 of the powder clogging between the disk-rotor and
10 the sealing surfaces of the cavities of this disk-
11 rotor.

12
13 The appended drawing shows schematically and by way
14 of example an embodiment and an alternative of the
15 device for the controlled distribution of
16 pulverulent products, which is the object of the
17 present invention.

18
19 Figure 1 is a general view of an abrasive particle
20 projection apparatus;

21
22 Figure 2 is a perspective view of the device for the
23 controlled distribution of pulverulent products,
24 which is included in this abrasive apparatus;

25
26 Figure 3 is a sectional view along line III-III of
27 Figure 2;

28
29 Figure 4 is a sectional view along line IV-IV of
30 Figure 2;

31

1 Figure 5 is a sectional view similar to that of
2 Figure 4 showing an alternative.

3

4 Although Figure 1 shows by way of example the device
5 which is the object of the invention for the feeding
6 of an abrasive particle projection apparatus, this
7 device is in no way limited to this application but
8 can be used instead in all applications where a
9 pulverulent substance must be continually
10 distributed in doses.

11

12 The pulverulent material to be distributed is
13 contained in a feed hopper 1, the outlet of which is
14 in communication with an inlet aperture 2 of the
15 distribution device. This inlet aperture 2 passes
16 through upper part 3a of a supporting structure 3
17 and is in communication with an inlet aperture 4 of
18 an upper sealing clamp 5a. One surface of this upper
19 clamp 5a, which is integral with upper part 3a of
20 supporting structure 3, is in frictional contact
21 with the upper surface of a dosing disk-rotor 6 and
22 forms the active sealing surface of this sealing
23 clamp 5a. Dosing disk-rotor 6 is provided with two
24 circular and concentric series of cylindrical
25 transfer cavities 7, 8 passing through an annular
26 portion 6a of dosing disk 6, the paths of which pass
27 through inlet apertures 2, 4. The cylindrical
28 transfer cavities of these two circular series are
29 half a pitch apart, such that the amount of
30 pulverulent product distributed is substantially
31 constant as a function of time.

32

1 Lower part 3b of supporting structure 3 is integral
2 with a lower clamp 5b, the active surface of which,
3 which is in frictional contact with the lower
4 surface of annular portion 6a of dosing disk 6,
5 forms a sealing surface.

6
7 The centre of dosing disk 6 comprises a tubular hub
8 6b which extends on either side of this disk 6 and
9 which is used to receive the inner raceways of two
10 ball bearings 9a, 9b, the outer raceways of which
11 are integral with both upper 3a and lower 3b parts
12 respectively of supporting structure 3. Tubular hub
13 6b of disk 6 is linked to annular part 6a through
14 which cylindrical transfer cavities 7, 8 pass by
15 means of a tapered circular part 6c designed to
16 impart a degree of resilient freedom to annular part
17 6a perpendicular to the sealing surfaces of clamps
18 5a, 5b, enabling uniform distribution of the
19 frictional forces of sealing surfaces 5a, 5b between
20 both faces of annular part 6a.

21
22 As can be seen in Figure 4, upper part 3a of
23 supporting structure 3 comprises an aperture 10
24 which is in communication with an aperture 11 formed
25 through upper sealing clamp 5a, located in annular
26 portion 6a of dosing disk 6 inside which both
27 circular series of cylindrical transfer cavities 7,
28 8 are formed. As illustrated by Figure 1, these
29 apertures 10 and 11 are linked to a pressurised air
30 source 12.

31
32 Lower part 3b of supporting structure 3 also

1 comprises a distribution aperture 13 which is in
2 communication with a distribution aperture 14 formed
3 through lower sealing clamp 5b. These distribution
4 apertures 13 and 14 are aligned with apertures 10,
5 11 which pass through the upper part of the
6 supporting structure and upper sealing clamp 5a
7 respectively, such that these apertures 10, 11 are
8 in communication with distribution apertures 13, 14
9 through both circular series of cylindrical transfer
10 cavities 7, 8 of dosing disk 6, the paths of which
11 pass through apertures 10, 11, 13 and 14.

12
13 As can be noted in Figure 2, the angular distance,
14 in relation to the centre of dosing disk 6, between
15 inlet apertures 2, 4 and distribution apertures 13,
16 14 is less than 90° and is in fact, in this example,
17 even less than 45° between the centres of both
18 apertures 2 and 13.

19
20 Until now, it was thought necessary to have as large
21 an angle as possible between the inlet and the
22 distribution of the pulverulent product to ensure
23 closure of the transfer cavities of circular series
24 7, 8 of dosing disk 6 when they transport the
25 pulverulent substance from inlet 2, 4 towards
26 distribution 13, 14. It is for this reason that the
27 angle was 180° . It was noted that if the positioning
28 of both sealing clamps 5a, 5b was carried out taking
29 as a reference the axis of dosing disk 6, the
30 resulting precision allows for a closing effect
31 which is practically unaffected by the distance
32 between the inlet and the distribution, due to the

1 very large degree of guiding precision between
2 dosing disk 6 and sealing clamps 5a, 5b. This
3 precision allows for precise contact between disk 6
4 and clamps 5a, 5b. Due to the smaller frictional
5 surface between disk 6 and clamps 5a, 5b, the
6 device, which is the object of the invention, allows
7 heating to be reduced. Dosing disk 6 is rotated by
8 a shaft 15 of a drive gear motor M (Figure 1). This
9 shaft 15 is made rotationally integral with dosing
10 disk 6 by key 16.

11
12 The operation of the device for the controlled
13 distribution of pulverulent products described above
14 consists in filling feed hopper 1 with the
15 pulverulent product to be distributed. This hopper 1
16 can comprise any adequate device to prevent clogging
17 of the pulverulent product at its outlet and
18 guarantee even flow of this product. Such a device
19 is not part of the present invention, such that it
20 has not been shown, insofar as it was not useful for
21 the understanding of the invention.

22
23 Dosing disk 6 is rotated by gear motor M and shaft
24 15. As both circular series of apertures 7, 8 pass
25 under inlet apertures 2, 4 through upper part 3a of
26 supporting structure 3 and upper clamp 5a, transfer
27 cavities 7, 8 fill with pulverulent material through
28 their inlet apertures adjacent to the upper surface
29 of dosing disk 6. Lower sealing clamp 5b closes the
30 distribution apertures of these cylindrical transfer
31 cavities 7, 8 adjacent to the lower surface of
32 dosing disk 6. As this dosing disk 6 moves towards

1 distribution apertures 13, 14 which pass through
2 lower sealing clamp 5b and lower part 3b of
3 supporting structure 3, upper sealing clamp 5a
4 closes the inlet apertures of cylindrical transfer
5 cavities 7, 8, thus precisely limiting the volume of
6 pulverulent material transferred towards the
7 distribution apertures for each cylindrical cavity
8 7, 8.

9
10 When these transfer cavities 7, 8 arrive opposite
11 distribution apertures 13 and 14 and apertures 10
12 and 11 linked to the pressurised fluid source 12,
13 they put distribution apertures 13, 14 in
14 communication with this pressurised fluid source,
15 such that the pulverulent material which is in
16 cylindrical transfer cavities 7, 8 is ejected
17 through distribution apertures 13, 14.

18
19 In the alternative shown by Figure 5, dosing disk 6'
20 is formed with two concentric parts 6'a, 6'c linked
21 together by a series of floating rivets 18, such
22 that the degree of freedom of outer annular part 6'a
23 which supports transfer cavities 7, 8 is further
24 increased.